

Non Union of Fracture of the Neck of Femur in Young Adult

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Introduction

Non union is the most common complication of fracture neck of femur. Fracture of the neck of the femur has multiple factors leading to difficulties in union. Both biological and mechanical parameters contribute to the development of union complications. On biological side the lack of cambium layer of the periosteum of femoral neck and the presence of synovial fluid at the fracture site inhibit fracture union. Poor bone quality also plays a part. Mechanical parameters include the amount of vertical inclination of the fracture line, quality of reduction, stability of fixation and integrity of the posterior cortex [1]. These mechanical factors lead to an unstable fracture. Poor implant placement after fixation contributes further to nonunion.

Elderly patients with non-union of femoral neck fracture are not expected to show union with any osteosynthetic procedure and they are treated by appropriate arthroplasty procedure.

The factors, on which the management depends on, are age of the patient, vascularity, remaining bone quality, status of the articular surface and sphericity of the femoral head and alignment of the neck and shaft. Accordingly, non union of femoral neck can be classified in following 3 stages [2]. Stage I is when fracture surfaces are still irregular (Fresh), size of proximal fragment is 2.5 cm or more, gap between the fragments is 1 cm or less and head is viable. In stage II the fracture surfaces are smoothed out, size of the proximal fragment is 2.5 cm or more, gap between the fragments is more than 1 cm but less than 2.5 cm and the head of the femur is viable. Stage III includes smoothing of fracture ends, proximal fragment less than 2.5 cm gap between the fragments is more than 2.5 cm and a vascular necrosis of head of the femur.

Management options being used currently are

- Osteosynthesis with or without vascularized or non vascularized bone grafting
- Osteotomy, displacement or angulations type
- Osteosynthesis with muscle pedicle bone grafting
- Replacement (hemiarthroplasty or THR).

McMurray [3] proposed a displacement osteotomy in which the femur is placed medially beneath the femoral head following an oblique osteotomy from base of greater trochanter to the upper end of lesser trochanter. He used it with good results in non union and fresh fractures of femoral neck. The union occurred between 3 fragments and head remained viable. In later series though the functional results had been good but union at the fracture site has not been obtained always, shortening has been a constant feature and incidence of avascular necrosis has been between 18.2 to 22% [4].

Pauwels [5] demonstrated that the problem is essentially biomechanical. He described an abduction osteotomy at intertrochanteric level which shifts line of weight bearing medially and converts the shearing force at the non union site into a compression force as the fracture line becomes horizontal. However extreme valgus position shortens the lever arm, thus placing increased pressure on the head of femur during walking. He fixed the non union with graft and removed a wedge from lateral side to realign the femur in valgus position. Osteotomy is a biologic procedure [6]. A 20° to 30° wedge is removed to place the head of femur into valgus. Bone graft donor-site morbidity associated with other procedures is avoided. It may be considered as a primary procedure for treatment of neglected femoral neck

fractures. Coxa vara and shortening can be corrected simultaneously. Limb length equalization can be achieved by valgus positioning and lateralization of the distal fragment.

The fibular graft Osteosynthesis can be used for femoral neck non-union when the non-union site is well-aligned with low shear angle [7]. Fibula being cortical bone provides mechanical strength to the fixation besides stimulating union. The incorporation of fibular graft with the surrounding bone gives biological fixation. Once the graft is re-vascularized, the osteoblasts stimulated by bone morphogenic protein replace the resorbed bone of the femoral neck and subchondral region. If this bone is appropriately stressed, the graft acquires sufficient strength to handle the observed forces. Avascular heads may revascularise after union. Open reduction ensures good alignment of the fracture: the anterior approach minimizes vascular insult as the main blood supply is posterior.

Judet [8] described quadratus femoris based muscle pedicle bone graft for femoral neck fractures. Meyers et al. [9] modified it and reported its use in 150 cases of fracture of the neck of the femur with internal fixation. Later they used it for delayed treatment of fracture of the neck of the femur in 32 patients with union in 72% of them [10]. This method has also been used by Baksi [11] with good results.

Muscle pedicle bone grafting is a useful technique accelerating healing of the femoral neck fractures, while maintaining viability of the femoral head. Patient's age, type of fracture, and duration of fracture have no effect on the results.

Thus the management of ununited fracture of femoral neck will depend on the stage of nonunion and various options are [12]

Stage I

- Closed reduction and internal fixation
- Internal fixation and free fibular graft.
- Muscle pedicle graft
- Valgus osteotomy

Stage II

- Internal fixation and free fibular graft.
- Muscle pedicle graft
- Valgus osteotomy

Stage III

- Arthroplasty

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